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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/802,639	03/16/2004	Matthew J. Carey	HSJ920040056US1	4918

44425 7590 10/31/2006

THOMAS R. BERTHOLD
18938 CONGRESS JUNCTION COURT
SARATOGA, CA 95070

EXAMINER	
KLIMOWICZ, WILLIAM JOSEPH	
ART UNIT	PAPER NUMBER
2627	

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/802,639	CAREY ET AL.
	Examiner	Art Unit
	William J. Klimowicz	2627

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7,9,10,12-14,16-23,25,27-37,39 and 41* is/are rejected.

7)☒ Claim(s) *6,8,11,15,24,26,38 and 40* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on September 23, 2006 has been entered.

Claim Status

Claims 1-41 are currently pending.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 7, 9, 10, 12-14, 16, 18, 20, 22, 23, 25, 27-32, 34-37, 39 and 41 are rejected under 35 U.S.C. 102(e) as being anticipated by Li et al (US 6,704,175 B2).

As per claim 1, Li et al (US 6,704,175 B2) discloses a magnetically-coupled structure (e.g., FIGS. 2, 3, 4, 6 or 7) in a magnetic device of the type having a substrate (material upon which shield base (10) is formed) and a plurality of ferromagnetic layers, the structure being formed on the substrate and comprising: a first ferromagnetic layer (5) having an in-plane (net) magnetization (60a-40a) direction oriented in a first direction (into page as seen in FIGS. 2, 3, 4, 6 or 7); a second ferromagnetic layer (90) magnetically-coupled (magnetostatically) to the first ferromagnetic layer (5) and having an in-plane magnetization (90a) direction oriented substantially orthogonal to said first direction in the absence of an applied magnetic field (e.g., FIGS. 2, 3, 4, 6 or 7); and an electrically-conducting spacer layer (70) (relatively conductive in order to conduct current in the CPP mode) between the first (5) and second (90) ferromagnetic layers, the spacer layer (70) inducing substantial orthogonal (i.e., transverse) magnetic coupling of the second (90) ferromagnetic layer to the first (5) ferromagnetic layer.

As per claims 2, 22 and 34, wherein the spacer layer (70) between the biasing (5) and free (90) layers is an alloy comprising X and Mn, wherein X is selected from the group consisting of Pt, Ni, Fe, Ir, Pd and Rh (e.g., see COL. 5, lines 49-52).

As per claims 3 and 35, wherein the XMn alloy includes one or more elements selected from the group consisting of Cr, V, Pt, Pd and Ni (e.g., see COL. 5, lines 49-52).

As per claims 4, 23 and 36, wherein the spacer layer (70) is a PtMn alloy having a thickness less than approximately 100 Angstroms (e.g., see COL. 5, lines 49-54).

As per claims 5 and 37, wherein the PtMn alloy has a thickness between approximately 15 and 50 Angstroms (e.g., see COL. 5, lines 49-54).

As per claims 7, 25 and 39, wherein the spacer layer (70) between the biasing (5) and

free (90) layers consists essentially of Cr or Mn (though not entirely).

As per claims 9, 27 and 41, wherein the spacer layer (70) consists essentially of a transition-metal alloy selected from the group consisting of Cu, Ru, Rh, Ir and Os (e.g., see COL. 5, lines 49-52).

As per claim 10, further comprising an antiferromagnetic layer (30) exchange-coupled with the first ferromagnetic layer (5) for substantially preventing rotation of the magnetization of the first ferromagnetic layer (5) in the presence of an applied magnetic field.

As per claim 12, wherein the device is a current-perpendicular-to-the-plane magnetoresistive sensor (CPP-GMR) and wherein the second ferromagnetic layer (90) is the sensor free layer whose magnetization (90a) direction is free to rotate in the presence of an applied magnetic field, the magnetization (90a) of the free layer (90) being stabilized across the spacer layer (70) by the first ferromagnetic layer (5).

Additionally, as per claim 13, the magnetoresistive sensor (e.g., FIGS. 2, 3, 4, 6 or 7) capable of sensing external magnetic fields when a sense current is applied perpendicular to the planes of the layers in the sensor (i.e., the sensor is a Current-Perpendicular-to-the Plane [CPP] sensor), the sensor comprising the aforementioned substrate; the free ferromagnetic layer (90) having an in-plane magnetization direction (90a) oriented substantially in a first direction in the absence of an external magnetic field, said free layer magnetization direction (90a) being substantially free to rotate in the presence of an external magnetic field; a pinned ferromagnetic layer (110) having an in-plane magnetization direction (110a) oriented in a second direction substantially orthogonal to said first direction (e.g., FIGS. 2, 3, 4, 6 or 7); a first antiferromagnetic layer (130) exchange-coupled to the pinned layer (110) and preventing

substantial rotation of the magnetization direction (110a) of the pinned layer (110) in the presence of an external magnetic field in the range of interest; a nonmagnetic spacer layer (100) between the free (90) and pinned (110) layers; a ferromagnetic biasing layer (5) magnetically-coupled to the free layer (90) and having an in-plane magnetization (60a-40a) direction oriented substantially orthogonal to said first direction (along (90a)) in the absence of an external magnetic field; and an electrically-conducting spacer layer (70) between the biasing (5) and free layers (90), the spacer layer (70) between the biasing (5) and free (90) layers inducing substantial orthogonal (transverse) magnetic coupling of the free layer (90) to the biasing layer (5).

As per claim 14, further comprising a second antiferromagnetic layer (30) exchange-coupled with the biasing layer (5) for substantially preventing rotation of the magnetization direction (60a-40a) of the biasing layer (5) in the presence of an external magnetic field in the range of interest.

As per claim 16, wherein the nonmagnetic spacer layer (70) is electrically conducting (to support CPP-mode).

Additionally, as per claim 18, wherein the pinned layer (100) is located between the substrate and the free layer (90) and the free layer (90) is located between the pinned layer (100) and the biasing layer (5) - see COL. 6, lines 21-23..

As per claim 20, wherein the sensor is a magnetoresistive read head for reading magnetically recorded data from tracks on a magnetic recording medium (COL. 1, line 13 *et seq.*), wherein the substrate is a first shield (10) formed of magnetically permeable material and having a substantially horizontal planar surface (e.g., see FIG. 3), wherein the free (90) and

pinned (100) layers and nonmagnetic spacer layer (100) have *substantially* vertical side walls defining a sensor trackwidth less than the width of the first shield (10) - FIG. 3, and wherein the biasing layer (5) is on the substrate (10) beneath the free layer and extends beyond (i.e., slightly) the sensor trackwidth - see FIGS. 3 and 4.

Additionally, as per claim 28, Li et al (US 6,704,175 B2) discloses current-perpendicular-to-the-plane magnetoresistive read head [CPP-MR] for reading magnetically recorded data from tracks on a magnetic recording medium (COL. 1, line 13. *et seq.*), the head comprising: a first shield (10) of magnetically permeable material and having a substantially horizontal planar surface (e.g., FIGS. 2, 3, 4, 6 or 7); a ferromagnetic biasing (5) layer on the first shield (10) and having an in-plane magnetization direction (60a-40a) oriented in a fixed direction in the absence of a magnetic field from the medium; an electrically-conducting magnetically-coupling layer (70) on the biasing layer (5); a free ferromagnetic layer (90) on the magnetically-coupling layer (70) and magnetically-coupled across the magnetically-coupling layer to the biasing layer (5), the free layer (90) having an in-plane magnetization (90a) direction oriented approximately orthogonal to the fixed magnetization direction (60a-40a) of the biasing layer (5) in the absence of a magnetic field from the medium and substantially free to rotate in the presence of a magnetic field from the medium; a nonmagnetic spacer layer (100) on the free layer (90); a pinned ferromagnetic layer (110) having an in-plane magnetization direction (110a) parallel to the fixed magnetization (60a-40a) direction of the biasing layer (5); an antiferromagnetic layer (130) exchange-coupled to the pinned layer (110) and preventing substantial rotation of the magnetization direction of the pinned layer (110) in the presence of a magnetic field from the medium; and wherein the free (90) and pinned (110) layers and nonmagnetic spacer layer (100)

have *substantially* vertical side walls defining a sensor trackwidth less than the width of the first shield (10) (e.g., FIGS. 2, 3, 4, 6 or 7), and wherein the biasing layer (5) extends (slightly) beyond the sensor trackwidth - see FIG. 3.

As per claim 29, wherein the magnetically-coupling layer (70) extends (slightly) beyond the sensor trackwidth - FIG. 3.

As per claim 30, further comprising an antiferromagnetic layer (30) between the first shield (10) and the biasing layer (5) and exchange-coupled with the biasing layer (5) for substantially preventing rotation of the magnetization direction (60a-40a) of the biasing layer (5) in the presence of a magnetic field from the medium, the antiferromagnetic layer (130) exchange-coupled to the biasing layer (5) extending (slightly) beyond the sensor trackwidth (see FIG. 3).

As per claim 31, wherein antiferromagnetic layer (30) exchange-coupled to the biasing layer (5) is formed of a material selected from the group consisting of PtMn, NiMn, FeMn, IrMn, PdMn, PdPtMn and RhMn (see COL. 4, lines 48-51).

As per claim 32, wherein the head is a spin-valve head and the nonmagnetic spacer layer (100) is electrically-conducting (COL. 4, lines 45-46).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 17, 19, 21 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (US 6,704,175 B2).

See the description of Li et al (US 6,704,175 B2), *supra*.

As per claims 17 and 33, although Li et al (US 6,704,175 B2) remains silent with respect to wherein the sensor operates in a tunnel junction mode whereby the nonmagnetic spacer layer (100) is an electrically-insulating tunnel barrier, Official notice is taken that tunnel junction magnetoresistive sensors having as a nonmagnetic spacer an insulative layer (typically alumina) are notoriously old and well known and ubiquitous in the art; such Officially noticed fact being capable of instant and unquestionable demonstration as being well-known.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the CPP-MR sensor of Li et al (US 6,704,175 B2) as being a conventional and ubiquitous CPP -tunnel junction MR sensor.

The rationale is as follows: one of ordinary skill in the art would have been motivated to provide a conventional CPP-tunnel magnetoresistive sensor with the advantages espoused by the CPP-MR spin valve sensor of Li et al (US 6,704,175 B2), since tunnel spin valve sensors are known to have a higher resistance, and thus provide more sensitivity due to a higher MR ratio, and to further provide the advantages espoused by Li et al (US 6,704,175 B2) into such a conventional TMR sensor, such as an in-stack bias and an in-stack transverse bias via a single layer.

Additionally, as per claim 21, Li et al (US 6,704,175 B2) further discloses wherein the electrically-conducting spacer layer (70) between the biasing (5) and free layers (90) is on the

biasing layer (5) and extends beyond the sensor trackwidth (at least slightly as seen in FIGS. 3 and 4) by slightly extending laterally more that the free layer (90).

As per claim 19, although Li et al (US 6,704,175 B2) remains silent to wherein the pinned layer (100) is an antiparallel-pinned layer, such antiparallel-pinned layers, conventionally known as synthetic antiferromagnetic layers (SAF) used as pinned layers in magnetoresistive heads are notoriously old and well known and ubiquitous in the art; such Officially noticed fact being capable of instant and unquestionable demonstration as being well-known.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the pinned layer (100) of Li et al (US 6,704,175 B2) as being a ubiquitous antiparallel-pinned layer (e.g., conventionally known as synthetic antiferromagnetic layers (SAF)).

The rationale is as follows: one of ordinary skill in the art would have been motivated to provide the pinned layer (100) of Li et al (US 6,704,175 B2) as being a ubiquitous antiparallel-pinned layer (e.g., conventionally known as synthetic antiferromagnetic layers (SAF)) in order to further mitigate the effect of magnetostatic coupling on the free layer, as is well known, established and appreciated in the art.

Allowable Subject Matter

Claims 6, 8, 11, 15, 24, 26, 38 and 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William J. Klimowicz whose telephone number is (571) 272-7577. The examiner can normally be reached on Monday-Thursday (6:30AM-5:00PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Thi Nguyen can be reached on (571) 272-7579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

William J. Klimowicz
Primary Examiner
Art Unit 2627

WJK